

Evaluation of Early Entry Sawing of PCCP

Background

Contraction or control joints are generally established in concrete pavements through sawing of the hardened concrete. These sawed joints create a weak plane in the slab, which promotes cracking of the slab at that plane. The joints provide the stress relief needed for the concrete while controlling the location of cracks. It is common practice in Missouri to saw transverse control joints at 15' spacing. The sawed joints also provide a smooth wide channel in the slab that can be filled with sealant material to keep moisture and incompressible materials out of the cracks in the slab.

Missouri Department of Transportation standards require transverse contraction joints in concrete pavements to be sawed a minimum width of 3/8" and a minimum depth of 1/4 the pavement thickness. These sawed joints are cut with conventional 65hp diamond saws. According to MoDOT specifications, "sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling". With conventional sawing equipment, these sawed joints are usually cut between 8 and 24 hours after concrete placement, depending on weather conditions and concrete mix characteristics.

An early entry saw is lighter than a conventional saw. Early entry sawing is a dry sawing operation, requiring no water source. The lightweight early entry saw permits sawing of the concrete at earlier ages than could be done with the heavier conventional saws. Establishing the joints earlier is believed to increase the probability that the concrete will crack at those joints rather than relieving stresses through random cracking. It is also believed that the standard joint depth of 1/4 of the pavement thickness is not necessary with early entry sawing. The manufacturer recommends joint depth of 1/10 the pavement thickness, but at least 1" when using the early entry saw.

Project Information

Three projects (US 60 in Wright Co., US 63 in Osage Co. and US 65 in Benton Co.) were selected to evaluate the use of an early entry concrete saw manufactured by SoffCut International, Inc. Test sections were established in each of the three projects to compare early entry sawing at various depths with conventional sawing at the standard depth. All transverse joints were spaced at 15'.

The early entry saw used to establish the joints for this evaluation was a SoffCut 20hp model. The SoffCut saw is equipped with a dust shield that prevents dust produced during sawing from becoming airborne. The dust is left neatly alongside and inside the saw cut. The dust is in the form of damp powder because the concrete is still green. It may be blown from the pavement with pressurized air, swept or washed with water if available. The SoffCut saw is also equipped with a skid plate that protects against raveling. The skid plate performed well. Very little raveling was observed around joints made by either the Soff-Cut or the conventional saw.

Test Section # (Pav't Thickness)	Dimensions of Transverse Joint	Type of Saw Used	# of Joints	Time After Paving Joints were Established	AmbientTemp. Range from Paving to 7 days after	% of joint cracks that developed by: (from time of sawing)			
						1 day	3 days	5 days	7 days
US60-TS1 (12")	3/8" x 1 1/2"	Soff-Cut	42	3 1/2-6 hours	50 - 90 °F	11.9%	54.8%	64.3%	71.4%
US60-TS2 (12")	3/8" x 3"	Conventional	42	8-9 hours	50 - 90 °F	31.0%	81.0%	92.9%	95.2%
US63-TS1 (10")	3/8" x 1 3/4"	Soff-Cut	31	6-7 hours	30 - 75 °F	3.2%	35.5%	41.9%	51.6%
US63-TS2 (10")	3/8" x 1 3/4"	Soff-Cut	13	6-7 hours*	30 - 75 °F	0.0%	23.1%	23.1%	38.5%
US63-TS2 (10")	3/8" x 1 3/4"	Soff-Cut	21	17-18 hours*	30 - 75 °F	14.2%	38.1%	38.1%	42.9%
US63-TS3 (10")	3/8" x 2 1/4"	Soff-Cut	33	17-18 hours*	30 - 75 °F	48.5%	66.7%	72.7%	76.5%
US63-TS4 (10")	3/8" x 3"	Conventional	34	18 hours	30 - 75 °F	0.0%	20.6%	23.5%	44.1%
US65-TS1 (12")	3/8" x 1 1/2"	Soff-Cut	35	3-4 hours	70 - 95 °F	94.3%	94.3%	97.1%	97.1%
US65-TS2 (12")	3/8" x 2 1/4"	Soff-Cut	35	3-4 hours	70 - 95 °F	94.3%	100.0%	100.0%	100.0%
US65-TS3 (12")	3/8" x 3"	Conventional	35	8-10 hours	70 - 95 °F	100.0%	100.0%	100.0%	100.0%

* early entry sawing was stopped for 12 hours overnight and resumed the next morning

Performance Data

The table above shows details of the transverse joints, ambient temperatures and the rate at which cracks developed at the joints in each of the test sections.

Only two small random cracks were observed in one test section. The cracks are believed to be related to poor consolidation rather than stress relief. Overall, all of the joints effectively controlled random cracking. As can be seen in the table, generally the early entry sawed joints did not crack as rapidly as the conventional joints.

The early entry sawing operation consisting of one saw with operator achieved similar or slightly better production in terms of joints per hour than two conventional saws with operators.

Ambient conditions were the main factor affecting saw timing and joint crack development; however, the US 65 project was constructed with concrete



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with a 2" maximum size coarse aggregate. This large coarse aggregate did not adversely affect the sawing operation or the development of joint cracks in that project.

Current Status

A specification is currently being reviewed that would allow the use of the early entry saw at a depth of 1/8 the pavement thickness as an alternate to conventional concrete saws at 1/4 the pavement thickness. Use of early entry saws has been shown to provide acceptable resistance to random cracking in PCCP, and is expected to result in time and cost savings due to the observed increased productivity compared to conventional sawing methods.

A full construction report, RDT01-010 "[Evaluation of Early Entry Sawing of PCC Pavement](#)" is available.

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